



LOSS PREVENTION REPORT

ADMINISTRATIVE RECORD

M&M Protection Consultants

W.R. GRACE & COMPANY
ZONOLITE DIVISION
LIBBY, MONTANA

M&M Protection Consultants



W.R. GRACE & COMPANY
ZONOLITE DIVISION
LIBBY, MONTANA

INSPECTED BY: Michael E. Gerdts

DATE: August 11 & 12, 1982

CONFERRED WITH: Messrs. W. J. McCaig, General Manager
W. J. Melcher, Safety Director

MANAGEMENT SUMMARY:

Operations at this facility consists primarily of mining, milling and shipping vermiculite commonly known under the trade name "Zonolite". Mining and material transportation equipment and movement is typical of to that of the mining industry. Processes and milling equipment are specific to this location and replacement could be time consuming if immediate repairs cannot be made.

Major deficiencies regarding property loss prevention which may result in a large loss are briefly noted as follows:

- a. Implementing a formal fire loss prevention inspection and maintenance program.
- b. Provide a clean water suction source for the fire pumps which has sufficient capacity for the type of fire which can be expected at this facility.
- c. Raze the Old Dry Mill Building which constitutes a severe fire exposure to adjacent buildings, electric supplies and material movement.
- d. Extend the fire main to the north end of the plant so that adequate fire protection can be provided for the fuel oil tanks.
- e. Provide an automatic fire suppression system for the control room of the stacker/reclaimer.
- f. Provide a fixed type dry chemical extinguishing system for major pieces of mine equipment.
- g. Provide automatic sprinkler protection for diesel fuel and/or combustible materials which are located within several of the buildings.

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- h. Provide a dike or berm to control or contain a potential leak or rupture at the diesel storage tanks from flowing down into the truck lineup area.

DESCRIPTION OF OPERATIONS:

Primary operations at this facility consists of mining, processing and shipping of vermiculite. The mine operates two shifts per day, 8:00 a.m. to 4:30 p.m. and 6:00 a.m. to 2:30 a.m., five days per week. The mill operates three shifts per day, five days per week. There are approximately 170 employees at this facility.

CONSTRUCTION:

Major operations are conducted at three locations: The mine and mill site, the screening plant and in "Town". There are approximately 65 structures which have a total floor area of approximately 291,500 square feet. Types of construction as a function of square footage and percent of total square footage are as follows:

Construction Type	Sq. Ft.	Percent Of Total Sq. Ft.
Noncombustible	150,000	52%
Combustible	141,000	48%
Fire Resistive	560	less than 1%

The age of structures falls into two principle categories: The original buildings are 30-50 years old and the new plant buildings are approximately 10 years old. Attached to this report (Addendum #1) is a list of buildings which contain the following information: building number, name, type of construction, number of stories, total square feet, protection, and remarks. Of the buildings listed, most are old buildings. Some, such as Building Nos. 8, 9, and 10, (the Old Dry Mill, Old Dryer Building and Old Wet Mill) are in a state of considerable disrepair and for the most part have been abandoned in place. Most useable equipment has been removed and the facilities serve little function. The major new structures include Building Nos. 11, 12, 13, 36 and 37.



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EXPOSURES:

The mine and mill site are located in mountainous terrain at approximately 3500 feet above mean sea level (MSL). Exposures from adjacent forest land are slight as a significant clear space is located between structures and the trees. There are no foreign exposures. Mutual exposures are considered severe, particularly between Building Nos. 8, 19, 20, 21, 21A, 21B, and 21C. This exposure is due to the combustible construction of the six story Old Dry Mill Building No. 8. In the event of a fire in this facility, the likelihood of flames spreading to Buildings 19 and 21A is considered very high. A loss of this type would significantly hinder operations by disrupting the transportation of in-process products between the mill site and the lower bins. If this occurred, it would be necessary to truck materials from the mill site to the screen plant which has been done in the past. Damage to adjacent electric substations would most likely result in cessation of processing at this facility.

Exposure to fire loss at the screen plant facility is considered slight as all major buildings are of noncombustible construction and there are no significant foreign or mutual exposures at this facility.

Exposures to facilities in "Town" are considered moderate from materials on railroad cars. Mutual exposures are considered moderate due to the lack of protection for the combustible buildings.

PROCESSES:

Mining vermiculite at this facility consists primarily of removing overburden and ore from the top of a mountain in a stairstep type fashion at 20' intervals. Equipment for mining includes the following: three drills; five R-85 Euklids (dump trucks - 85 ton capacity, each valued at approximately 1/2 million dollars); three Catapillars, model 992, front end loaders; one Catapillar, model 998, front end loader; one Kamatsu tracked vehicle (equivalent to a D8); and one Catapillar tracked vehicle, model D7. Ore, transported via dump trucks, is moved from the mine to the Transfer Point (Building 28) where it is reduced to an acceptable size for processing. Major equipment includes a grizzly, wobble feeder, screens, and conveyors. Electrical equipment is in conduit and is sealed. Reducing equipment is powered by electro hydraulic systems. The capacity of hydraulic oil is approximately 50 gallons. Acceptable sized ore is transported via an enclosed underground and elevated covered conveyor to the Ore Storage and Blending Building (Building No. 13).

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Ore entrance is via a top center opening whereby it is stacked and subsequently removed from the building via a sophisticated piece of equipment called the stacker/reclaimer. In brief, the ore is gravity fed along a slide which has openings at various levels. These openings divert ore onto a pile beginning at the center of the building and gradually filling towards the outer edge of the building. While stacking, this unit oscillates approximately 170 degrees and proceeds to fill one half of the building from the center out. Simultaneously, the reclaimer is also in operation and oscillates approximately 170 degrees. It moves the ore to the center bottom of the building where it is deposited into a chute and onto an underground conveyor. The reclaimer portion is similar to an inverted bucket elevator whose angle of attack can be varied such that it will begin reclaiming from the top of the pile, oscillating back and forth, while gradually moving downward as the pile is removed. When either the stacker has filled its portion of the building to capacity, or the reclaimer has removed all of the material from its portion of the building, the stacker/reclaimer is rotated 180 degrees and the stacking and reclaiming process proceeds. This piece of equipment is important to this operation in that reportedly there are only two such units in operation in the world. In the event of its malfunction, it becomes necessary to manually move ore to the portions of the building for stacking as well as moving the ore to the entrance to the conveyor tunnel. Reportedly this has been done in the past without significant disruption to operations.

Once ore leaves the O.S. & B building, it is disposed into the 1,000 ton Surge Bin (Building No. 12) which acts as a material supply for the Wet Mill (Building No. 11). Ore is gravity fed out of the bottom of the Surge Bin into an elevated enclosed conveyor to the tenth floor of the Wet Mill where processing begins.

The primary operation of the Wet Mill consists of separating the vermiculite from the tailings. This process involves screening, dewatering, scrubbing, emulsifying and drying vermiculite. Precise details are not provided since they have been developed by personnel within this company and are confidential. Equipment also has been developed by this company and is manufactured specifically for this use, thus replacement is considered time consuming and expensive. Tailings leaving the building are in a water slurry and are removed to the Tails Booster Pumphouse (Building No. 40A) and on to the Tails Skid (Building No. 40B) where the material is deposited on the hillside. Vermiculite although not in its finished form is then moved via conveyor to the old Dry Mill Building (No. 8) where it is placed in a bin, then into the "Toonerville Trolley".



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The "Toonerville Trolley" consists of two ore cars with side dumps which operate on a single track which has a bypass located midway. As one car is being filled at the top the other is being dumped at the Lower Bin (Building No. 25). Once the cars have been respectively filled and dumped, one starts down the track as the other one simultaneously comes up the track, they pass in the middle and the cycle goes on. Reportedly there have been few significant incidents regarding this system.

Material from the Lower Bin is gravity fed into dump trucks and transported into the Screen Plant which is located on the bank of the Kootenai River. Material is dumped at the Truck Dump (Building No. 37) and is conveyed into a 350 ton surge bin which is the primary supply for the Screen Building (Building No. 36). The material is then transferred by a conveyor and elevator legs (2) to the upper levels where it is sized and sampled. Once sizing has occurred, material is then transported to the Production Bins (Building No. 32). From there it can be placed in the Open Storage Shed (Building No. 31), the Ore Silos (Building No. 35) or moved directly across the river to the River Loading Station (Building No. 35). As conditions dictate, material from the Open Storage Shed or the Silos can be moved via conveyors to the Transfer House, Scale House and Sample House and then conveyed across the river.

At the River Loading Station, materials are deposited into rail cars for transportation.

A limited amount of storage and car loading can occur at the "Town" site however, at present, no significant activities are ongoing.

The most important operation occurring in "Town" is the management of this operation and EDP operations.

SPECIAL HAZARDS:

a. Explosives:

Ammonium Nitrate, powder and caps are used in the mining operation. Separate locked concrete magazines embedded in the hillside located a significant distance from all structures are provided for the storage of these materials. Each magazine is separated from the others by a minimum of 50' and do not face each other. At present, the ammonium nitrate magazine contains miscellaneous storage. Ammonium nitrate is kept in an elevated metal tank located approximately 100' from the other magazines. The material is also stored and transported on a rubber tired vehicle. "No Smoking" signs are posted in the area. Only licensed explosives technicians have keys to the magazines and are allowed to work with these materials.



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b. Mine Equipment:

A fire loss in any one piece of mobile mining equipment can be a serious loss, however, a loss involving diesel fuel within the engine compartment within one of the 85 ton capacity dump trucks is of particular concern. To reduce the probability of serious damage, detection and extinguishment must occur within a short period of time following ignition. First aid suppression utilizing a fire extinguisher by the machine operator is difficult because the operator's location is directly above the engine compartment and a significant distance off the ground. This reduces the operator's ability to immediately access the fire with a manual fire extinguisher and makes it difficult for him to do an adequate extinguishing job. For effective extinguishment, a sufficient amount of agent must be properly placed to extinguish the original fire and a sufficient amount of agent be available to prevent a recurrence. To do this, a fixed pipe, dry chemical extinguishing system is necessary. Automatic activation is preferable, however, not mandatory. In providing such a unit, we believe it will seriously reduce the potential of having a large fire loss involving one of these units. At present, one dump truck is equipped with a fixed pipe, manual dry chemical extinguishing system. The remainder are equipped with a single fire extinguisher.

c. Conveyors:

Aside from transporting ore or finished product by rubber tired vehicles, conveyors are the principal method of moving materials from one location to another at this facility. Conveyors range in size from several feet long to over 500 feet long. Small sections are underground, however most are elevated, enclosed conveyors. Supports and enclosures are for the most part noncombustible. Rubber belting is not fire retardant treated. The product being transported is noncombustible. This does not eliminate the need for fire protection as the rubber belts themselves burn very well. Conveyor systems are not provided with automatic trips which will shut down the system in the event of a significant belt slow down or misalignment of belts. Interlocks are also not provided to shut off the power on contributing conveyors. Manual trip lines are provided along the conveyor which can be activated by personnel in the event of a problem. In areas where conveyors are near the ground, vegetation has been sufficiently cleared to reduce the probability of a grass fire from spreading to the combustible belts.

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In the event of a fire involving conveyor belting in an enclosed conveyor, dry standpipes are available for first-aid use. Each is equipped with a minimum of 75' of fire hose and spaced approximately 150' apart. In areas where conveyors are covered and located between the old Dry Mill Building (No. 8) and the new Wet Mill (No. 11), fire hydrants with hose houses are provided for first-aid use. Automatic sprinkler protection over conveyors is not provided.

Conveyors located at the river site fall into two categories: screw conveyors and rubber belt conveyors. Screw conveyors are provided along the top of the silos and rubber belt conveyors are provided in the following locations: in tunnels underneath the silos; in a tunnel located along the north side of Building No. 31; in tunnels located along the Production Bins; and in the open from the Sample House, extending across the Kootenai River to the River Loading Station. The latter conveyor is approximately 500' long and is suspended from each end. It is important to note that the only form of fire suppression at this site in the event of a fire involving rubber belting is fire extinguishers. In the event of a rubber conveyor belt fire in a tunnel, it would be very difficult for personnel to access the area and extinguish the fire until professional assistance arrived.

A significant amount of conveyor belt is used at this facility. There exist no significant amounts of spare belts on site. In the event of a loss, it must be obtained from suppliers in Spokane, Washington, which may represent a one- to two-day delay. This assumes that the supplier has a sufficient amount of belt in stock.

d. Boilers:

Three boilers are located in the Boiler House (Building No. 22b). All are oil fired, high pressure, Cleaver Brooks package boilers. They are rated as follows:

Boiler No.	PSI	MBTU/Hour
1	150	6.27
2	190	6.3
3	150	6.3

Each boiler is provided with approved combustion controls. Oil is supplied to the units from three 40,000 gallon fuel oil tanks located downhill and north of the plant. Oil is steam heated and is continuously circulated between the Boiler House and the Oil Pump House. Heat from the boilers is used primarily for the operating of process equipment and heating buildings.

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e. **Dryer:**

A fluid bed oil fired (No. 2) ore dryer is located in the northwest corner of the Wet Mill on the ground floor. It is located within a hollow concrete block wall which cuts it off from the remainder of the mill. It is provided with the following combustion interlocks: low combustion air, low oil pressure, differential air pressure, low oil temperature, high oil temperature and a flame sensor. It is also equipped with a combustion control sequencer which follows the appropriate steps of purge, proving the pilot, proving the main flame, etc. etc. This unit is lit off with propane.

f. **Storage:**

Aside from ore and finished products storage, the only other significant amount of storage in the plant occurs in the Warehouse (Building No. 21). It contains primarily parts and supplies which are located in a shelf storage arrangement. The shelving is 18 and 21 feet long, 9 and 10 feet high, and 2 to 2½ feet deep. Aisles are 3 feet wide. A dry pipe automatic sprinkler system is provided for this area and will provide adequate protection as long as all areas needing sprinklers are provided with sprinklers. Please see the recommendations section of this report for several additional areas where sprinklers are needed.

g. **Cyclones and Dust Collectors:**

Cyclones and Dust Collectors are not needed for most of the process as the material is damp or wet. The main locations for dust collection are in the Old Dry Mill Building (No. 8) and at the Screen Building (No. 36). At both locations, dry product is handled such that a sufficient amount of airborne dust necessitates the need for dust collection. Bags or filters containing the dust consist of combustible synthetic material, however, not in sufficient quantities such that an automatic suppression system is recommended. Spare filters are available on site.

h. **Flammable or Combustible Liquids:**

Please see Addendum No. 2 which contain a list of all flammable or combustible liquid storage areas at this facility. Of the various uses and storage locations, those below are considered necessary to discuss.



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Two 50,000 gallon diesel fuel tanks are located in the mine service area (fuel stands) and they are utilized to fuel mine vehicles. These tanks are located on the hillside and are not provided with a berm or dike to contain a leak or discharge. Immediately downhill from these tanks is the truck lineup area where the five 85 ton dump trucks are normally parked. The provision of a dike or berm to contain a potential discharge or direct it away from this parking area is considered important.

The second item is the storage and utilization of diesel fuel within the Wet Mill (No. 11). A 2,000 gallon diesel fuel tank is located in the ground level of this building where only standpipe protection is provided. In the event of a leak in this tank, the contents will discharge into a grated trough which will direct the material out to the crash down tank. This material is used in the flotation process, however information regarding the amount and description of usage is confidential thus a complete evaluation of this hazard could not be made. This does not negate the need for automatic sprinkler protection.

Valves, pumps and steam heating equipment is provided in the Oil Pump House which extends along the edges of the fuel oil tanks located at the north end of the mill site. In the event of a fire within this structure, flame spread could occur throughout, due to flashover and combustible wood frame construction. The collapsing of the facility along with high temperature may cause piping and/or tank failures which could lead to a serious fire loss involving tank contents. There is no fire water supply provided at this end of the plant.

Last and most important is the fire pump house. The 220 gallon diesel fuel tank for the engine driven fire pump is located within this structure which does not have an automatic sprinkler system. In the event of a fire involving this material, both fire pumps as well as other pumps within the building could be damaged such that they are not available for service. Serious consideration should be made to provide automatic sprinkler protection in this building.

COMMON HAZARDS:

A single source, one-way feed electric supply is provided for this facility. It is routed via the Screen Plant and up the canyon to the mine and mill site. Utility owned substations provide each site with 480 and 240 volt alternating current utilizing oil filled transformers which are in all cases located outside of buildings a sufficient distance

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to reduce the probability of having a fire from the transformers involving permanent buildings. Interruptions to this supply have occurred and result in the cessation of operations at this facility. Once the supply is resumed, plant operations are returned to service with a minimum of delay. Air conditioning is provided in the Wet Mill offices, Downtown Office and mine trailers by small air conditioning units which do not represent a serious hazard. Building heat in most cases is steam or electric resistance heaters. One exception is the Ore Storage & Blending which is heated by five #2 diesel oil force air units spaced evenly around the building. One 550 gallon oil tank located outside supplies each heating unit.

MANAGEMENT PLANNING AND CONTROL:

a. Housekeeping, Maintenance:

Both of these items were noted to be satisfactory within those areas of the plant which are occupied. In those buildings which have been abandoned, these items have been neglected and can increase the probability of having a loss.

b. Smoking Control:

Smoking is prohibited at all plant sites and within company-owned vehicles. This rule is strictly enforced. Offenders are required to attend a rehabilitation program or terminated.

c. Self-inspection Programs:

No formal fire protection inspection program exists at this facility. Extinguishers and dry pipe valve air pressures are monitored by monthly safety inspections, however, the program should be significantly increased to cover all aspects of fire protection. Please see the recommendation section of this report for more detail.

d. Emergency Response Team:

First-aid and fire suppression services are provided by a volunteer fire brigade. The existing program is being modified to include quarterly one-half day training for all brigade personnel and an annual eight-hour training for all site personnel which covers fire fighting, fire warning, escape routes and a fire drill. Many of the fire brigade members are also members of the Volunteer Fire Department within the city of Libby. Personnel at the mill site



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are notified of an emergency by the siren located atop the Fire Pump House. An all wheel drive fire truck and ambulance are available for use by emergency response team members.

e. Cutting & Welding:

No formal cutting and welding program exists at this facility. Most of these activities are conducted within the various shops and garages at the mill site. A permit system is recommended for hot work operations in areas not designated as "hot work areas".

f. Emergency Planning:

Formal plans for earthquake and flood are reportedly provided at the office. These were not reviewed during this inspection.

PRIVATE PROTECTION:

a. Water Supplies:

Water for all purposes is pumped up to the mill and mine sites from the Pond Pump House (Building No. 26). Three 250 hp electric motors drive two 700 gpm at 460 psi and one 400 gpm at 425 psi pumps. These take water from the pond and provide it to the site via three 8-inch service lines approximately 1½ miles long. The pond is filled by a natural stream and supplemented by a 4-inch main several miles long supplied by a 250 hp electric vertical turbine pump which takes suction from the Kootnai River.

Two fire pumps, each rated at 1,000 gpm, at 125 psi, are provided in the Fire Pump House (Building No. 17) at the mill site. Approved controllers are provided and are set to automatically start the electric and diesel fire pumps at 90 and 80 psi respectively. Each is also provided with run timers which will discontinue the operation of the pump once system pressure has maintained a predetermined level for 7 and 15 minutes respectively. A jockey pump is provided to maintain system pressure between 90 and 100 psi.

The top six feet of three of the 45 ft. thickener tanks is the suction supply for the fire pumps. This water contains a significant amount of mineral material which in the past has contributed to excessive wear of the fire pumps and have fouled the cooling system on the diesel engine driver. Each of the above-mentioned tanks will provide approximately 70,000 gallons of water for fire suppression purposes. Utilizing 1500 gpm, this supply will provide water for automatic sprinkler and hose streams for approximately 140 minutes.



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The diesel-driven fire pump was flow tested during this inspection. Results are shown on the attached "Pump and Water Test Data" form. Please see Addendum #3. This test drew down water levels in the thickener tanks such that a flow test of the electric-driven fire pump could not be run without causing an automatic shutdown of mill operations. For the many reasons noted above, we believe that a separate fire pump water supply should be provided. Please see the recommendations section of this report.

b. Yard Mains & Hydrants:

Ten-inch, 8-inch and 6-inch fire mains provide water supplies from the fire pumps to various hydrants and automatic sprinkler systems at the mill site. Hydrants with suitable equipped hose houses are provided at strategic locations where the highest concentration of buildings exists at the mill site. Hydrant protection is not provided at the north end of the mill site or at the Screening Plant.

c. Automatic Sprinklers:

Automatic sprinkler protection is provided in most of the garage and shop buildings at the mill site. Most systems are dry pipe, ordinary hazard pipe schedule systems. Please see Addendum No. 3 for specific details. Sprinkler system control valves are not locked open or inspected under a formal inspection program. They are observed monthly by the safety committee. Drain tests conducted during this inspection indicated conditions are normal. Local alarms tested satisfactorily.

d. Security Service:

During working hours, a security agent is located at the main gate which provides access to the mine and mill sites. During non-working hours, bi-hourly unrecorded rounds are made through the mill site and Screening Plant sites. Reportedly these rounds will be recorded in the future.

e. Detection and Alarm Systems:

All automatic sprinkler systems are provided with local alarms. The fire pump when operating is provided with a running alarm which notifies operators in the Wet Mill Building as well as sounds a siren and illuminates a beacon on top of the Fire Pump House. A heat detection system is located within the Screen Building (Building



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No. 36) located at the Screening Plant and transmits an alarm to the Guardhouse at the entrance to the mine and mill site. Dry pipe sprinkler alarms are provided with automatic low air pressure alarms.

f. Extinguishers, Standpipes & Hose:

Fire extinguishers are satisfactorily located, inspected and maintained throughout all buildings and on major mobile mine equipment. A standpipe system is provided on each floor of the 10-story Wet Mill Building. Each hose connection is provided with 50' of 1½ inch fire hose. Elevated enclosed conveyors are provided with 50' or 75' of 1½ inch hose located strategically along the conveyor belts.

Hose houses normally equipped with 200' of 2½ inch and 200' of 1½ inch fire hose along with appropriate nozzles and wrenches are located at each fire hydrant.

g. Other Protection:

An emergency generator rated at 85 KW or 106.25 KVA is located within the Boiler House and will supply emergency power to the boilers, 90' thickener, and emergency lighting in the Guard House, control room, and stairwells within the Wet Mill.

PUBLIC PROTECTION:

a. Water Supplies:

There is no public water supply at the mine, mill site or Screening Plant. One public fire hydrant is located adjacent to the property at the end of a long, 4- and 6-inch dead-end water main at the "Town" site.

b. Fire Department:

The Libby Volunteer Fire Department will respond to a fire at any of the plant locations. Response time at the "Town" site is estimated to be ten minutes; response time to the mill and mine site is estimated to be 20 to 40 minutes. This Department has a single station located within Libby.

c. ISO Class:

To this writer's knowledge, this is the only volunteer fire department within the nation with a Class 4 rating. Until this inspection I had believed that no volunteer fire department could attain this rating.

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LIFE SAFETY AND CONSTRUCTION FEATURES:

Buildings are provided with a sufficient number of exits to evacuate personnel in the event of an emergency.

EDP OPERATIONS:

EDP equipment is located in the Office (Building No. 1) located in downtown Libby. Computer equipment consists of the following: an IBM System 34 processing unit, Model 5340; terminal, Model 5251; data station, Model 3741; printer, Model 5211; communications modum, Model 3864. The above-mentioned equipment is owned by W.R. Grace and primarily processes general ledger, payroll and inventory information. Records are duplicated on a daily basis and removed off site to a backup location on a weekly basis. A backup computer in Kalispel, Montana is provided and has been satisfactorily tested.

BUSINESS INTERRUPTION REVIEW:

The mining, milling, transporting, screening and shipping process is primarily a single-flow process with one operation dependent upon the previous. There are no significant duplicate facilities or parallel operations at this site. The process however appears to be very well designed as a failure at one point will not immediately cause all following operations to be discontinued. This is due to the stockpiling of materials at various stages such that in the event of a failure in one location, sufficient time is allowed to utilize the stockpile of materials while either a repair is made or a temporary operation is implemented. The ability of plant personnel to innovate remedies under adverse conditions while minimizing the impact on the plant operations appears to this writer as excellent. All this is not to say that the facility cannot be shut down. The most apparent cause of complete plant shutdown is a failure in the electrical supply. Until electric energy is restored, no significant operations can take place. To suggest a secondary electrical supply be brought in from the public utility to this remote location appears unreasonable.

Conveyors are utilized to move material from one location to another in as many places as practical. In several cases, the conveyors are approximately 500' long and would appear to cause significant delays in the event of their loss. In the event of the loss of a conveyor at the Screening Plant and River Loading Station, plant personnel in the past have been forced to transport materials to the "Town" site, where they can be loaded into railroad cars. In the event of a loss of conveyors at the mine or mill sites, it would be necessary to truck materials from point to point. This has also been done in the past.

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A loss of the use of the stacker/reclaimer located in the Ore Storage and Blending Building has occurred in the past and resulted in the manual movement of material from one location to another while the machine was being repaired. Due to the sophistication and automation of this machine, as well as the lack of duplicate machines and spare parts, this is an important piece of equipment which, although not critical to operation, can severely impact operations, thus the installation of automatic fire suppression within the control room of this unit is considered important. Please see the recommendations section of this report.

Very small amounts of spare conveyor belting are located on site and minor repairs can be made. Reportedly larger amounts are available from suppliers located in Spokane, Washington, however the availability and amount on any given day may vary significantly.

As mentioned before, much of the equipment utilized at this facility has been manufactured by personnel of this company for specific use here. Much of the equipment is one-of-a-kind thus is not mass produced. This can be a significant source of business interruption in the event of a catastrophic loss. Under normal conditions, losses to the type of equipment found at this facility appear not to have the potential for a long business interruption.

A severe fire involving the Control Room in the Wet Mill would cause operations to cease as most equipment is controlled from that room. Down time could be several weeks or months depending upon how fast temporary repairs can be made so that equipment can be restarted. To reduce the down time in the event of a fire, we recommend that complete sprinkler protection be provided in this room.

LOSS ESTIMATES:

Probable Maximum Loss (PML): The largest probable loss, property damage (PD) and business interruption (BI), which is to be expected, excluding a catastrophic condition, with normal protection facilities or procedures failing or rendered inoperative but with secondary defenses intact and functioning.

PD = 20%

BI = 6 months

Maximum Possible Loss (PML): The largest loss, property damage and business interruption together, which is to be expected under adverse conditions not excluding the catastrophic condition of massive releases

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of flammable gasses, seismic disturbances, tidal waves, flood connected with hurricane, and with protective equipment not functioning. Damage will be limited only by spacing between major facilities or by blank fire walls.

PD = 50%

BI = 2 years

RECOMMENDATIONS:

- 82-1 A formal fire protection inspection and maintenance program should be developed. This should include the assignment of a person in charge to ensure that the program is implemented and satisfactorily carried out. Please see Addendum #4 which includes a brief description of maintenance or inspection item and frequency with which they should be done. From this list, a fire prevention, maintenance and inspection program can be developed to fit the needs of this particular facility.
- 82-2 All valves controlling water supplies to automatic fire protection systems should be locked in the open position with nonbreakable shackle locks. This will reduce the probability of unauthorized valve closures.
- 82-3 A cutting and welding permit system should be adopted for all hot work operations which are conducted in areas other than those normally occupied for hot work operations.
- 82-4 A clean water suction source should be provided for the fire pumps which will supply a sufficient amount of water for the anticipated type of fire which can occur at this facility. It is recommended that a standard 100,000 gallon capacity suction tank with appropriate freeze protection and cathodic protection be provided at this facility.
- 82-5 The six story Old Dry Mill (Building No. 8) constitutes a severe exposure hazard to adjacent buildings, the main electrical supplies to the plants which are located immediately to the east and interruption to the movement materials from the Wet Mill to the Lower Bin. The provision of an automatic suppression system for this abandoned building is not considered practical. It is recommended that the building be demolished thus removing the exposure hazards.
- 82-6 A 10" fire main should be extended to the north end of this site so that adequate fire suppression water supplies can be provided for protection of the fuel oil tanks and the Oil

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Pump House. It is recommended as a minimum that dry barrel hydrants and suitably equipped hose house be provided.

- 82-7 Due to the importance of the stacker/reclaimer located within the Ore Storage and Blending Building (Building No. 13), an automatic fire suppression system should be provided within the control room of that unit. This suppression system can be carbon dioxide or halon 1301. This, if installed can prevent a severe fire loss involving electric equipment within this room.
- 82-8 Fixed pipe dry chemical extinguishing systems should be provided for all of the 85 ton dump trucks located at the mines. An automatic actuation system is preferred, however, a manual operated system is acceptable.
- 82-9 Automatic sprinkler protection should be provided for the following areas:
- a. Below the suspended ceiling within the main control room in the Wet Mill. The automatic sprinkler system above the present suspended ceiling could be acceptable above of the existing ceiling panels are replaced with approved dropout ceiling panels.
 - b. Behind the main control panel located within the control room in the Wet Mill.
 - c. Above the 2,000 gallon diesel oil storage tank located on the first floor of the wet mill building and for 20 feet beyond the perimeter of the area where oil could flow in the event of a vessel rupture.
 - d. Fire Pump House (Building no. 17).
 - e. The following areas within the Storage Building (Building No. 21):
 1. The entry area (two heads).
 2. "Gold Room" (two heads).
 3. The stairway (two heads).

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- 82-10 A dike or berm should be provided about the two 20,000 gallon diesel storage tanks located at the mine service area fuel stand. It should be designed to contain or discharge a leak or rupture to a safe location. At present a rupture in one of these tanks will cause diesel fuel to flow down hill directly into the truck lineup area.
- 82-11 The dry pipe automatic sprinkler system located immediately east of building 22 in the canopy area should be connected to a fire suppression water supply. This system has been installed, however appears the installation was never completed.
- 82-12 The fire hydrant located immediately north of the Boiler House should be connected to the fire water system using a 6" main. The 3" service water supply is not considered an adequate source for fire suppression purposes.
- 82-13 Water supplies for automatic sprinkler systems should be provided by the fire pumps. We recommend that the automatic sprinkler system in the Engineering Office (building 22C) be provided from this source rather than the domestic water source from which it is now being supplied.

BUILDING INFORMATION

BLDG. #	NAME	CONST.	STORES	SQ. FT.	PROTECTION	REMARKS
01	"Town" Office	CB STDX	1	2500	NS	Rented Building
02	"Town" Oil Pump House	CISF	1	150	NS	
02A	"Town" Boiler	CIUF	1	375	NS	Not In Use
02B						Not In Use
02C	Tank Car Unloading Pump	CIWF	1	80	NS	Not In Use
03	Old Expanding Plant	CIWF	1,1=2	4510	NS	Training Room, Fiber Lab Storage
04	Open Storage (Bin #10)	WD	1-2	7047	NS	Vacant
05	Scale House	CIWF	1=2	2964	NS	Includes Misc. Storage
06	Sample Storage	WD, CIWF	1	1250	NS	One Samples in Bags
07	Storage Silos (Bins #6-9)	WD	1=2		NS	
07A	"Export" (Bagging Plant)	WD	1,1=2	2810	NS	Pallet Mfg. & Dust Coll. Bagging Machine Bag Storage
07B	Dump Hopper (Truck)	CISF	1	300	NS	
08	"Old" Dry Mill	CI/WD & SF	6	20,340	NS	Nearly Abandoned Dust Coll. & Fill
09	"Old" Dryer Building	CI/WD & SF	1=2	5040	NS	Abandoned
10	"Old" Wet Mill	CISF	1=2, 1=3	17,634	NS	Nearly Abandoned, Mill Wright Shop
11	"New" Wet Mill & Office	ST.SF.	3,4,5, & 10	55,050	Part AS	AS in office only
12	1000 Ton Surge Bin	ST.SF.	1=3	35' Dia.	NS	
13	Ore Storage & Blending	ST/WD/WF	1=2	280' Dia.	NS	Stacker/Reclaimer
14	#1&2, 45 ft. Thickener	CIWF	1	100	NS	
15	#3&4, 45 ft. Thickener	CIWF	1	100	NS	
16	"Crash Down" Pump No.	CIWF	1	120	NS	
17	Fire Pump House	CB, STDK	1	720	NS	
18	Old #5 Bin	ST & WD	1	30' Dia.	NS	
18A	Ore Storage Bins (4)	ST & WD	1=3	20' Dia.	NS	Not in Use
19	Research Storage	CISF	1	810	NS	
20	Research Bldg.	WD	1	1350	AS	
21	Warehouse & Machine Shop	WD	1&SPABY	3008	AS	
21A	Millwright, Machine Elec. Shop	CIWF	2	1800	AS	

BUILDING INFORMATION

BLDG. #	NAME	CONST.	STORES	SQ. FT.	PROTECTION	REMARKS
21B	Storage Building	CISF	1	300	NS	
21C	Storage Building (Canopy)	ST.WF.	1	3280	AS	
22	SheetMetal & Carpenter Shop	CISF	1	3630	AS	
22A	SheetMetal Shop Addn.	CISF	1	800	AS	
22B	Boiler House	CISF	1	1120	AS	
22C	Engineering Office	CIWD	1	1200	AS	As Supply Domestic
22D	Lunch Room	WD	1	2400	NS	
23	Garage	CISF	1=2	6454	AS	
24	Fire Truck Garage	CISF	1=2	1728	NS	Old Filter House
25	Lower Ore Bin	WD	1=3	1000	NS	
26A	Drinking Water Pump House	WD	1	75	NS	
27	Old Tails Mill	CIWD	3	4200	NS	
28	Transfer Point	CIWD	4=6, 1=2	6864	NS	
29	Mine Office Trlrs (3)	ALV/WF	1	1320	NS	
29A	Storage Shed	WD	1	444	NS	
29B	Mine Lunch Room	ALV/WF	1	400	NS	
30	Truck Service Shop	CIWF	1=2	1500	NS	Sheep Shed
31	Open Storage Shed	CISF	1=2	36,450	NS	
32	Production Bins	CISF	1=2	3888	NS	
33	River Loading Station	CISF,WD	1, 3	1000	NS	
34	Lumber Storage	CIWF	1	875	NS	
34A	Restroom & Storage Bldg.	CISF	1	200	NS	
34B	Storage Bin	CIWD	1	100	NS	
35	River Silos (10)	ST	1=3	35' Dia.	NS	1250 Ton Capacity Each
35A	Sample House	CISF	1=3	200	NS	
35B	Scale House	CISF	1=2	200	NS	
35C	Transfer House	CISF	1=2	250	NS	
36	Screen Plant	CISF, CINF	6, 1	14,424	NS	
37	Truck Dump	CIWF	1	900	NS	
38	Valve House	CIWD	1	300	NS	

BUILDING INFORMATION

BLDG. #	NAME	CONST.	STORES	SQ. FT.	PROTECTION	REMARKS
39A	Cap Magazine	CONC	1	48	NS	
39B	Powder Magazine	CONC	1	256	NS	
39C	Ammonium Nitrate Magazine	CONC	1	256	NS	Misc. Storage Only
40A	Tails Booster Pump	STSF	1	224	NS	
40B	Tails Skid	STSF	1=3	960	NS	
41	Flocculant Mix Bldg.	CISF	1	300	NS	90 Ft. Thickener
TOTAL				291,452		

RECAPITULATION

CONST. TYPE	SQ. FT.	% of TOTAL SQUARE
Non. Comb.	150,976	52
Combustible	140,477	48
Fire Resistive	560	41
Automatic Sprinkler	25,812	9

FLAMMABLE OR COMBUSTIBLE LIQUID TANK DATA

TANK NAME	CONTENTS	CAPACITY	LOCATION
Methanol Storage	50% Methanol	4300 gallons	S. of Wet Mill on grade
Mine Fuel Tanks	Diesel Oil, #2	2-12,000 gallons	S.W. of Truck Repair Shop
Heater Fuel Tanks	Diesel Oil, #2	5-550 gallons	About diameter of OS&B Bldg. (#13)
Mill Bldg. Diesel Oil	Diesel Oil, #2	2,000 gallons	Ground of Wet Mill Bldg. (#11)
Fire Pump Fuel	Diesel Oil, #2	220 gallons	In Pump House (#17)
Vehicle Fuel Tanks	Gasoline	3-4,000 gallons	Buried South of Engr. Bldg. (#22 C)
Oil Strg. Tanks	Oil		Buried East of Garage (#23)
Fuel Oil Tanks	Fuel Oil #5	2-40,000 gallons	NE of 90 ft. Thickener
Fuel Oil Tanks	Diesel Oil #2	40,000 gallons	NE of 90 ft. Thickener
Flootation Oil	Diesel Oil #2	40,000 gallons	NE of 90 ft. Thickener
Road Oil	Road Oil	8,100 gallons	NE of 90 ft. Thickener
Boiler Fuel	Diesel Oil #5	4,000 gallons	Buried N. of Boiler Bldg. (#22 B)



Pump and Water Test Data

ADDENDUM #3

Marsh & McLennan Consultants

Account: W. R. Grace
Location: Libby, Montana

Conducted By: M. E. Gerdtz
Date: August 12, 1982

Pump Data						Pressure Data			Flow Data					
Test No.	Pump No.	Pressure			R.P.M.	Location or Hyd. No.	Static Press.	Resid. Press.	Location or Hyd. No.	Outlet Diam. & Coeff.	Pitot Press	Flow	Total Flow	Remarks (Amps., Volts, Steam Pressure, etc.)
		Suct.	Disch.	Net										
1	Dies.	+4	100	96	---	---	---	--	Header	2½" (.8)	90	1400	1400	Rates Excellent
2	Dies.	+1	110	109	---	---	---	--	Header	2½" (.8)	65	1200	1200	
3	Dies.	153	4	149	---	---	---	--	Header	---	0	0	0	
1	Elec	144	4	140	---	---	---	--	---	---	0	0	0	Could not complete due to low water conditions

Model No. --- Lit./Min. kPa
Pump Design Data: 1000 G.P.M. 125 P.S.I. --- R.P.M.
Relief valve setting --- Size: ---
Type of priming for centrifugal pump ---
Horizontal, Vertical Pump ---
Number of Stages ---
Lift --- (Water Level to Discharge)

Driver --- Horsepower at Rated R.P.M.
Speed Governor setting --- R.P.M.



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ADDENDUM #4

AUTOMATIC SPRINKLER PROTECTION DATA

BLDG. #	NAME	TYPE OF SYSTEM	SPACING/HEAD	HEAD TEMP. °F	PIPE SCHEDULE	REMARKS
11	Wet Mill	Wet	86	212	OH	Anti Freeze System
20	Research Building	Dry	100	165	OH	Grinnel 4" Mod. A-2
21	Warehouse & Machine Shop	Dry	120	165	OH	Fed from 21A
21A	Millwright, Mach., Elec. Shop	Dry	120	165	OH	Grinnel 6", Mod. F300
22	Sheetmetal & Carp.Shops	Dry	56-96	212	OH	Grinnel 6", Mod. F300
22A	Sheetmetal Shop Addition	Dry				Not Hooked up
22B	Boiler House	Dry	205	286	OH	Grinnel 2", Mod. A-2
22C	Engineering Office	Wet	92	165	OH	Domestic Supply
23	Garage	Dry	90	212	OH	4" feed from Bldg. 22

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Libby, Montana

ADDENDUM #5

INSPECTION & TEST FREQUENCIES

I = Inspect
T = Test

	WK.	MO.	1/2	1	2	3	5
Sprinkler Control Valves - Not Supervised	I						
Sprinkler Control Valves - Padlocked		I					
Complete turn down of all Sprinkler Control Valves				T			
2" Drain Test				T			
Local Alarm Via Inspector's Test Connection			T				
Auto. Fire Detection System.		I	T				
Manual Fire Alarms (Local			T				
Waterflow Test - Private Hydrants				T			
Waterflow Test - Private Yard Main				T			
Waterflow Test - Fire Pump				T			
Fire Pump or Booster Pump - Churn	T						
Flush Hydrants				T			
1½" or 2½" Cotton Rubber Lined Hose		I			T		
Dry Pipe Valve - During Freezing Conditions	I(Daily)						
Dry Pipe Valve		I		T			
Quick Opening Devices		I		T			
Tank Overflow	I						
Anti-Freeze Solutions				T			
Check Valves - Including Fire Department Connection Check Valves							I
Dry Chemical Manual Ext. Syst.		I		T			
Combustion Controls - Boilers				T			

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Zonolite Division
Libby, Montana

ADDENDUM #5 (Continued)

INSPECTION & TEST FREQUENCIES

I = Inspect
T = Test

WK. MO. 1/2 1 2 3 5

Automatic Fire Detection Systems

I T

Plant Loss Prevention Inspection

I